

Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A method for fabricating a resist pattern narrowed below an optically theoretical limitation, comprising ~~the steps of:~~

forming a pre-resist pattern through exposure treatment and development treatment, said pre-resist pattern being made of a photoresist layer as a top layer and a polymethylglutarimide layer as a bottom layer, ~~and;~~

increasing bond strength between the pre-resist pattern and a base material by increasing an amount of relative contact area of the pre-resist pattern and the base material by ash-treating the pre-resist pattern; and

ash-treating the pre-resist pattern to form a the narrowed resist pattern.

2. (Original) A fabricating method as defined in claim 1, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

3. (Cancelled).

4. (Currently Amended) A fabricating method as defined in claim 1, further comprising ~~the steps of:~~

forming the polymethylglutarimide layer on a given base material;₁

forming the photoresist layer on the polymethylglutarimide layer;₁

exposing and developing the photoresist layer via a given mask;₁

partially removing the remaining polymethylglutarimide layer with an alkaline water solution to form the pre-resist pattern;₁ and

ash-treating the pre-resist pattern to form the narrowed resist pattern.

5. (Currently Amended) A fabricating method as defined in claim 4, wherein the pre-resist pattern has a T-shaped or reversed trapezoid longitudinal ~~cross-section~~cross-section, and the narrowed resist pattern has a corresponding T-shaped or reversed trapezoid cross-section.

6. (Previously Presented) A fabricating method as defined in claim 1, wherein the pre-resist pattern and the resist pattern are made of a picture reversion photoresist which is made by adding a negative working agent to a positive photoresist including a mixture of alkaline soluble phenol resin and naphthoquinonediazide.

7. (Currently Amended) A fabricating method as defined in claim 6, further comprising ~~the steps of~~:

coating the picture reversion photoresist on a given base material;₁

exposing the picture reversion photoresist via a given mask;₂

heating the picture reversion photoresist after the exposure treatment;₃

developing the picture reversion photoresist after the heating treatment to form the pre-resist pattern;₄ and

ash-treating the pre-resist pattern to form the narrowed resist pattern.

8. (Currently Amended) A fabricating method as defined in claim 7, further comprising ~~a step of~~ exposing the picture reversion photoresist uniformly after the heating treatment and before the developing treatment.

9. (Previously Presented) A fabricating method as defined in claim 7, wherein the pre-resist pattern has a T-shaped or reversed trapezoid longitudinal cross section, and the narrowed resist pattern has a corresponding T-shaped or reversed trapezoid cross-section.

10. (Previously Presented) A fabricating method as defined in claim 1, wherein the pre-resist pattern and the resist pattern are made of a novolac positive photoresist containing an additive phenol dissolution accelerator.

11. (Currently Amended) A fabricating method as defined in claim 10, further comprising the steps of:

coating the novolac positive photoresist containing the additive phenol dissolution accelerator on a given base material;_i

exposing via a given mask and developing the novolac positive photoresist, to form the pre-resist pattern;_i and

ash-treating the pre-resist pattern to form the narrowed resist pattern.

12. (Presently Presented) A fabricating method as defined in claim 11, wherein the pre-resist pattern has a T-shaped or reversed trapezoid longitudinal cross-section, and the narrowed resist pattern has a corresponding T-shaped or reversed trapezoid cross-section.

13. (Previously Presented) A method for patterning a thin film using a resist pattern as defined in claim 1.

14. (Currently Amended) A method for patterning a thin film corresponding to a resist pattern narrowed below an optically theoretical limitation, comprising ~~the steps~~:

forming a thin film to be milled on a given base material;_i

forming a polymethylglutarimide layer on the thin film to be milled;_i

forming a photoresist layer on the polymethylglutarimide layer;_i

exposing and developing the photoresist layer via a given mask;_i

partially removing the remaining polymethylglutarimide layer with an alkaline water solution to form a pre-resist pattern constructed of the photoresist layer as a top layer and the polymethylglutarimide layer as a bottom layer;_i

increasing bond strength between the pre-resist pattern and the base material by increasing an amount of relative contact area of the pre-resist pattern and the base material by ash-treating the pre-resist pattern;

ash-treating the pre-resist pattern to form ~~a~~ the narrowed resist pattern;_i and

milling the thin film to be milled via the narrowed resist pattern to obtain a patterned thin film.

15. (Original) A patterning method as defined in claim 14, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

16. (Previously Presented) A patterning method as defined in claim 14, wherein the pre-resist pattern has a T-shaped or reversed trapezoid longitudinal cross section, and the narrowed resist pattern has a corresponding T-shaped or reversed trapezoid cross-section.

17. (Currently Amended) A method for patterning a thin film corresponding to a resist pattern narrowed below an optically theoretical limitation, comprising the steps of:

forming a thin film to be milled on a given base material;₁

coating on the thin film to be milled a picture reversion photoresist which is made by adding a negative working agent to a positive photoresist including a mixture of alkaline soluble phenol resin and naphthoquinonediazide;₁

exposing the picture reversion photoresist via a given mask;₁

heating the picture reversion photoresist after the exposure treatment;₁

developing the picture reversion photoresist after the heating treatment to form a pre-resist pattern;₁

increasing bond strength between the pre-resist pattern and the base material by increasing an amount of relative contact area of the pre-resist pattern and the base material by ash-treating the pre-resist pattern;

ash-treating the pre-resist pattern to form a the narrowed resist pattern;₁ and

milling the thin film to be milled via the narrowed resist pattern to obtain a patterned thin film.

18. (Currently Amended) A patterning method as defined in claim 17, further comprising ~~the step of~~ exposing the picture reversion photoresist uniformly after the heating treatment and before the developing treatment.

19. (Previously Presented) A patterning method as defined in claim 17, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

20. (Previously Presented) A patterning method as defined in claim 17, wherein the pre-resist pattern has a T-shaped or reversed trapezoid longitudinal cross-section, and the narrowed resist pattern has a corresponding T-shaped or reversed trapezoid cross-section.

21. (Currently Amended) A method for patterning a thin film corresponding to a resist pattern narrowed below an optically theoretical limitation, comprising ~~the steps of~~:

forming a thin film to be milled on a given base material;

coating a novolac positive photoresist containing an additive phenol

dissolution accelerator on the thin film to be milled;

exposing via a given mask and developing the novolac positive photoresist, to form a pre-resist pattern;

increasing bond strength between the pre-resist pattern and the base material by increasing an amount of relative contact area of the pre-resist pattern and the base material by ash-treating the pre-resist pattern;

ash-treating the pre-resist pattern to form ~~a~~the narrowed resist pattern; and

milling the thin film to be milled via the narrowed resist pattern to obtain a patterned thin film.

22. (Original) A patterning method as defined in claim 21, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

23. (Previously Presented) A patterning method as defined in claim 21, wherein the pre-resist pattern has a T-shaped or reversed trapezoid longitudinal cross-section, and the narrowed resist pattern has a corresponding T-shaped or reversed trapezoid cross-section.

24. (Currently Amended) A method for patterning a thin film corresponding to a resist pattern narrowed below an optically theoretical level, comprising ~~the steps of~~:

forming a polymethylglutarimide layer on a given base material;_i

forming a photoresist layer on the polymethylglutarimide layer;_i

exposing and developing the photoresist layer via a given mask;_i

partially removing the remaining polymethylglutarimide layer with an alkaline water solution to form a pre-resist pattern constructed of the photoresist layer as a top layer and the polymethylglutarimide layer as a bottom layer;_i

increasing bond strength between the pre-resist pattern and the base material by increasing an amount of relative contact area of the pre-resist pattern and the base material by ash-treating the pre-resist pattern;

ash-treating the pre-resist pattern to form a ~~the~~ narrowed resist pattern;_i

forming a thin film to be patterned on the base material so as to cover the narrowed resist pattern;_i and

lifting-off the resist pattern to obtain a patterned thin film.

25. (Original) A patterning method as defined in claim 24, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

26. (Presently Presented) A patterning method as defined in claim 24, wherein the pre-resist pattern has a T-shaped or reversed trapezoid longitudinal cross-section, and the narrowed resist pattern has a corresponding T-shaped or reversed trapezoid cross-section.

27. (Currently Amended) A method for patterning a thin film corresponding to a resist pattern narrowed below an optically theoretical limitation, comprising ~~the steps of~~:

coating on a given base material a picture reversion photoresist which is made by adding a negative working agent to a positive photoresist including a mixture of alkaline soluble phenol resin and naphthoquinonediazide;

exposing the picture reversion photoresist via a given mask;

heating the picture reversion photoresist after the exposure treatment;

developing the picture reversion photoresist after the heating treatment to form a pre-resist pattern;

increasing bond strength between the pre-resist pattern and the base material by increasing an amount of relative contact area of the pre-resist pattern and the base material by ash-treating the pre-resist pattern;

ash-treating the pre-resist pattern to form ~~a~~ the narrowed resist pattern;

forming a thin film to be patterned on the base material so as to cover the narrowed resist pattern; and

lifting-off the resist pattern to obtain a patterned thin film.

28. (Currently Amended) A patterning method as defined in claim 27, further comprising ~~a step of~~ exposing the picture reversion photoresist uniformly after the heating treatment and before the developing treatment.

29. (Previously Presented) A patterning method as defined in claim 27, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

30. (Presently Presented) A patterning method as defined in claim 27, wherein the pre-resist pattern has a T-shaped or reversed trapezoid longitudinal cross-section, and the narrowed resist pattern has a corresponding T-shaped or reversed trapezoid cross-section.

31. (Currently Amended) A method for patterning a thin film corresponding to a resist pattern narrowed below an optically theoretical limitation, comprising ~~the steps of~~:

coating a novolac positive photoresist containing an additive phenol dissolution accelerator on a given base material;

exposing via a given mask and developing the novolac positive photoresist, to form a pre-resist pattern;

increasing bond strength between the pre-resist pattern and the base material by increasing an amount of relative contact area of the pre-resist pattern and the base material by ash-treating the pre-resist pattern;

ash-treating the pre-resist pattern to form ~~a~~the narrowed resist pattern;

forming a thin film to be patterned on the base material so as to cover the narrowed resist pattern; and

lifting-off the resist pattern to obtain a patterned thin film.

32. (Original) A patterning method as defined in claim 31, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

33. (Previously Presented) A patterning method as defined in claim 31, wherein the pre-resist pattern has a T-shaped or reversed trapezoid longitudinal cross-section, and the narrowed resist pattern has a corresponding T-shaped or reversed trapezoid cross-section.

34. (Currently Amended) A method for patterning a thin film corresponding to a resist pattern narrowed below an optically theoretical limitation, comprising ~~the steps of~~:

forming a thin film to be milled on a given base material;

forming a polymethylglutarimide layer on the thin film to be milled;

forming a photoresist layer on the polymethylglutarimide layer;

exposing and developing the photoresist layer via a given mask;

partially removing the remaining polymethylglutarimide layer with an alkaline water solution to form a pre-resist pattern constructed of the photoresist layer as a top layer and the polymethylglutarimide layer as a bottom layer;

increasing bond strength between the pre-resist pattern and the base material by increasing an amount of relative contact area of the pre-resist pattern and the base material by ash-treating the pre-resist pattern;

ash-treating the pre-resist pattern to form a narrowed resist pattern;

milling the thin film to be milled via the narrowed resist pattern to form a pre-patterned thin film;

forming a thin film to be patterned on the base material so as to cover the narrowed resist pattern; and

lifting-off the narrowed resist pattern to obtain a patterned thin film including the pre-patterned thin film.

35. (Original) A patterning method as defined in claim 34, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

36. (Previously Presented) A patterning method as defined in claim 34, wherein the pre-resist pattern has a T-shaped or reversed trapezoid longitudinal cross-section, and the narrowed resist pattern has a corresponding T-shaped or reversed trapezoid cross-section.

37. (Currently Amended) A method for patterning a thin film corresponding to a resist pattern narrowed below an optically theoretical limitation, comprising ~~the steps of:~~

forming a thin film to be milled on a given base material;

coating on the thin film to be milled a picture reversion photoresist which is made by adding a negative working agent to a positive photoresist including a mixture of alkaline soluble phenol resin and naphthoquinonediazide;

exposing the picture reversion photoresist via a given mask;
heating the picture reversion photoresist after the exposure treatment;
developing the picture reversion photoresist after the heating treatment to form a pre-resist pattern;
increasing bond strength between the pre-resist pattern and the base material by increasing an amount of relative contact area of the pre-resist pattern and the base material by ash-treating the pre-resist pattern;
ash-treating the pre-resist pattern to form a ~~a~~narrowed resist pattern;
milling the thin film to be milled via the narrowed resist pattern to obtain a pre-patterned thin film;
forming a thin film to be patterned on the base material so as to cover the narrowed resist pattern; and
lifting-off the narrowed resist pattern to obtain a patterned thin film including the pre-patterned thin film.

38. (Currently Amended) A patterning method as defined in claim 37, further comprising ~~a step of~~ exposing the picture reversion photoresist uniformly after the heating treatment and before the developing treatment.

39. (Previously Presented) A patterning method as defined in claim 37, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

40. (Previously Presented) A patterning method as defined in claim 37, wherein the pre-resist pattern has a T-shaped or reversed trapezoid longitudinal cross-section, and the narrowed resist pattern has a corresponding T-shaped or reversed trapezoid cross-section.

41. (Currently Amended) A method for patterning a thin film corresponding to a resist pattern narrowed below an optically theoretical limitation, comprising ~~the steps of~~:

forming a thin film to be milled on a given base material;₁
coating a novolac positive photoresist containing an additive phenol
dissolution accelerator on the thin film to be milled;₁
exposing via a given mask and developing the novolac positive photoresist, to
form a pre-resist pattern;₁
increasing bond strength between the pre-resist pattern and the base material
by increasing an amount of relative contact area of the pre-resist pattern and the base material
by ash-treating the pre-resist pattern;
ash-treating the pre-resist pattern to form ~~a~~the narrowed resist pattern;₁
milling the thin film to be milled via the narrowed resist pattern to obtain a
pre-patterned thin film;₁
forming a thin film to be patterned on the base material so as to cover the
narrowed resist pattern;₁ and
lifting-off the narrowed resist pattern to obtain a patterned thin film including
the pre-patterned thin film.

42. (Original) A patterning method as defined in claim 41, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

43. (Previously Presented) A patterning method as defined in claim 41, wherein the pre-resist pattern has a T-shaped or reversed trapezoid longitudinal cross-section, and the narrowed resist pattern has a corresponding T-shaped or reversed trapezoid cross-section.

44. (Previously Presented) A method for manufacturing a micro device, using a patterning method for a thin film as defined in claim 13.

45. (Original) A manufacturing method as defined in claim 44, wherein the micro device is a thin film magnetic head.

46. (Previously Presented) A manufacturing method as defined in claim 45, wherein a magnetoresistive effective thin film element of the thin film magnetic head is manufactured by a patterning method comprising the steps: forming a thin film to be milled on a given base material, forming a polymethylglutarimide layer on the thin film to be milled, forming a photoresist layer on the polymethylglutarimide layer, exposing and developing the photoresist layer via a given mask, partially removing the remaining polymethylglutarimide layer with an alkaline water solution to form a pre-resist pattern constructed of the photoresist layer as a top layer and the polymethylglutarimide layer as a bottom layer, ash-treating the pre-resist pattern to form a narrowed resist pattern, and milling the thin film to be milled via the narrowed resist pattern to obtain a patterned thin film.

47. (Currently Amended) A method for fabricating a resist pattern narrowed below an optically theoretical limitation, comprising ~~the steps of:~~

forming a pre-resist pattern through exposure treatment and development treatment, said pre-resist pattern being made of a novolac positive photoresist containing an additive phenol dissolution accelerator; and

increasing bond strength between the pre-resist pattern and the base material by increasing an amount of relative contact area of the pre-resist pattern and the base material by ash-treating the pre-resist pattern; and

ash-treating said pre-resist pattern to form a narrowed resist pattern.